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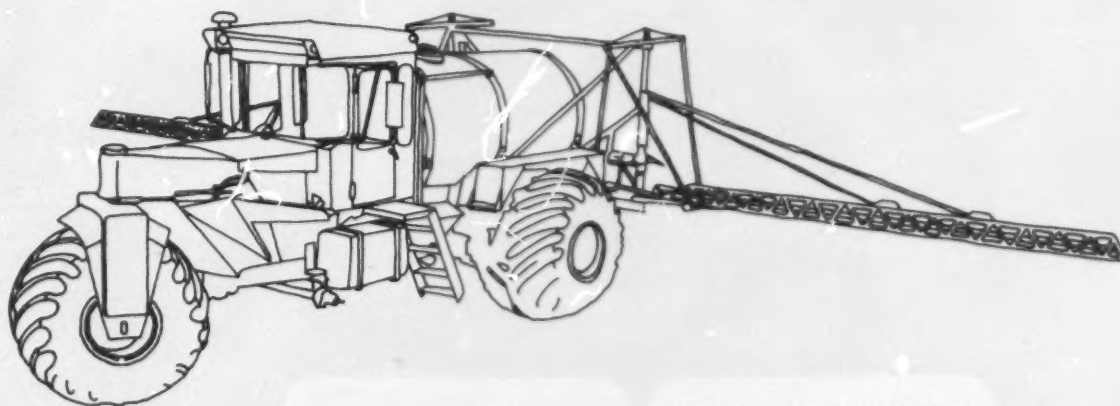
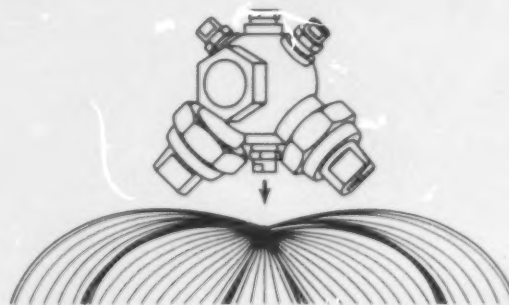
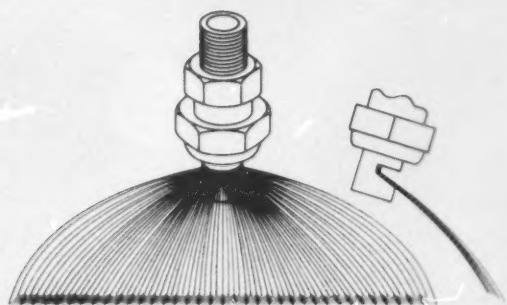
ABSTRACT

This slide set narrative is designed to provide the necessary information for certification as a private pesticide applicator. The program reviews information necessary to safely work with pesticides and to better understand pests and pest problems.
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ILLINOIS PESTICIDE APPLICATOR TRAINING AND CERTIFICATION PROGRAM



REVISED EDITION

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

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OCT. 1977



PART I. PESTICIDES AND YOU

1. Illinois Pesticide Applicator Training and Certification Program (title slide). This program will help prepare you for certification as a private pesticide applicator. The program reviews information necessary to safely work with pesticides and to better understand pests and pest problems.



2. Pesticides are essential for the production of food and fiber. They protect humans, animals and plants from pests. However, pesticides should be used only when necessary, applied precisely, stored safely and disposed of properly.

PESTICIDE DEATHS 1960-1975	
Insecticides	20
Herbicides	7
Rodenticides	8
Total	35

3. During the past 15 years, 35 persons in Illinois have died from pesticide poisoning. One death occurred from a pesticide used for agriculture.

PESTICIDE INGESTIONS	
Annually, 650 cases, involving children under 12, are reported in Illinois.	

4. However, 650 children under the age of 12 are treated annually for ingesting pesticides. Although this is only six percent of all accidental ingestions of poisonous substances by Illinois children, the point is that pesticide accidents do happen. Treat all pesticides as poisons.

Adviser's Note: Omit slides 5 and 6 if Illinois Department of Agriculture representatives explain the information at the beginning of the program.

THE LAW	
1. Classification of Pesticides	general use restricted use
2. Certification of Applicators	

5. In 1972 Congress amended the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). The act now provides stronger enforcement of pesticide registration, transportation, application, storage and disposal. The amended law requires the classification of all pesticides by the Environmental Protection Agency (EPA) as either "general use" or "restricted use" pesticides. It also demands that a person using restricted use pesticides be certified.

CLASSIFICATION

General Use - Public

Restricted Use - Certified Applicators

6. General use pesticides will not harm the applicator or the environment when they are used according to directions. Handling restricted use pesticides requires that the applicator have knowledge about pesticides beyond the normal label information. Pesticides may be classified for general use on some crops and restricted use on others.



UNDERSTANDING PESTICIDES

7. Understanding Pesticides (title slide)

PESTICIDE

A chemical or mixture of chemicals used to control unwanted animals, plants or plant diseases.

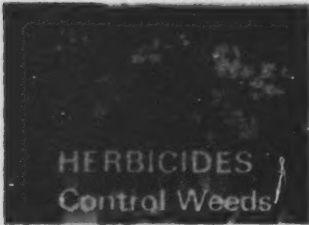
8. A pesticide is a chemical or mixture of chemicals used to control unwanted animals, plants and plant diseases.

INSECTICIDES Control Insects

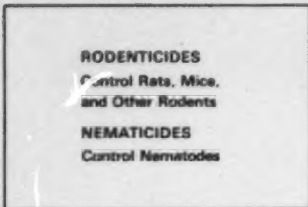
9. Often the word "insecticide" is confused with the word "pesticide." An insecticide is just one type of pesticide and is used to control insects and insect relatives.

FUNGICIDES Control Fungi

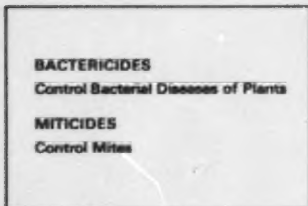
10. Fungicides prevent or control fungi that cause plant diseases. Fungicides may be either narrow spectrum, controlling few fungi, or broad spectrum, controlling many fungi. Systemic fungicides, which are absorbed by the plant and move through the living tissues without harming the plant, are frequently used.



11. Herbicides control weeds. They may be selective, killing certain plants without harming the crop, or nonselective, toxic to all plants.



12. Rodenticides control rats, mice and other rodents. Nematicides control nematodes.



13. Bactericides control bacterial diseases and miticides control mites.



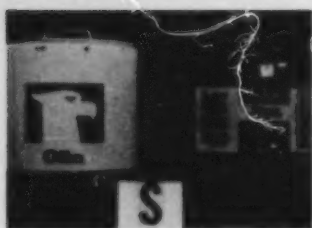
14. Harvest aids, such as defoliants and desiccants, regulate growth and maturity of a plant. Defoliants cause leaves to drop prematurely from a plant. Desiccants cause plants to dry out prematurely.



15. Repellents and attractants are used to divert a pest from or lure a pest to a location.



16. Usually the active ingredients of a pesticide cannot be used directly and must be combined with wetting agents or granules. The final product is called a pesticide formulation.



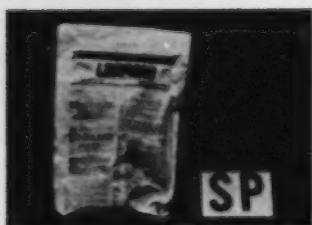
17. Many types of pesticide formulations are available. Solutions (S) completely dissolve when added to the spray tank and will not clog equipment.



18. Emulsifiable concentrates (EC or E) are liquid formulations that when mixed with water form a "milky" emulsion. Little agitation in the spray tank is needed when using EC's.



19. Wettable powders (WP or W) are dry formulations. Strong agitation is necessary in the spray tank to keep them in suspension. WP's wear out pumps and nozzles, but they are less likely than EC's to damage plants.



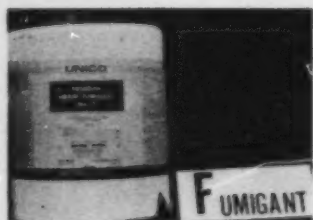
20. Soluble powders (SP) are like wettable powders except that they completely dissolve in water. Once SP's dissolve, no further agitation is necessary.



21. Flowables (F or L) are finely ground wettable powders that are sold as thick liquids to make them easier to add to the water in the spray tank. Flowables require only moderate agitation and seldom clog spray nozzles.



22. Granules (G) are applied directly to the soil or plants and are usually safer to apply than other formulations.



23. Fumigants are liquids when purchased but change into a gas when applied. They are most often injected into the soil, released under tarpaulins or used in buildings and grain bins to control insects, nematodes and some disease organisms.

WET FORMULATIONS

4 EC

8 F

8 S

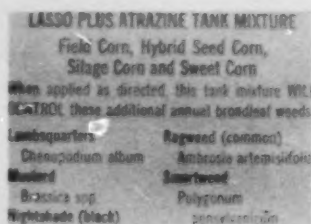
DRY FORMULATIONS

50 WP

10 G

80 SP

24. Wet formulations (EC's, F's and S's) measure active ingredients in pounds per gallon. For example, 4EC means four pounds of active ingredient per gallon of product. Dry formulations (WP's, G's and SP) measure active ingredients as a percent of the total weight. Fifty WP means 50 percent of the product's total weight is active ingredient.



25. Sometimes two pesticides can be mixed together and applied in order to be more effective or to save time and money. However, some pesticides are incompatible and cannot be mixed. Incompatible pesticides may produce an ineffective mixture or damage equipment. If the label does not specifically state that the materials can be mixed, check with the county Extension office.



26. Residue is the amount of a pesticide that can be found on a plant or in the soil after a pesticide has been applied. Some pesticides, such as atrazine, may remain in the soil for a long period of time and damage crops planted the following year.



27. Other pesticides, such as malathion, break down rapidly, lasting only a few days.



28. Tolerance is the amount of pesticide residue that may remain on food without endangering consumers. The EPA sets tolerance for each product. If the product exceeds the established tolerance, the grower is liable and can be penalized.

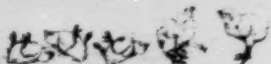
TOXICITY

The capacity of a pesticide to produce injury or death.

29. All pesticides are poisonous. They have to be to kill undesirable pests. Safe and proper handling depends on you knowing the toxic properties and having a respect for the potential hazards associated with them. Toxicity is the ability of a pesticide to produce injury or death.

LD₅₀

The amount of a pesticide that will kill 50% of a population of test animals.



30. LD₅₀ is the lethal dose of a pesticide that will kill 50 percent of a population of test animals. The lower the LD₅₀ number, the more toxic the pesticide. For example, a pesticide having a LD₅₀ of 75 is more toxic than one having a LD₅₀ of 300.

LABEL SIGNAL WORDS	TOXICITY RATING	ORAL LD ₅₀
Danger-Poison	High	0-50
Warning	Moderate	50-500
Caution	Low	500-5,000
Caution	Slight	5,000

31. Pesticides are rated according to their toxicity and pesticide labels contain signal words to indicate these ratings. Highly toxic pesticides have the skull and cross-bones and the words "Danger-Poison" on the label. Moderately toxic pesticides contain the word "Warning" and pesticides with a low or slight toxicity are labeled "Caution."

HOW HAZARDOUS IS A PESTICIDE?

1. Product Formulation
2. Type of Exposure
3. Length of Exposure

32. How hazardous a pesticide is depends on product formulation, type of exposure and length of exposure. A pesticide concentrate may be extremely toxic if taken orally but may not be hazardous when diluted with water and applied in a proper manner. Another pesticide may not be extremely toxic as it comes from the container, but it can be hazardous if used in a careless manner.

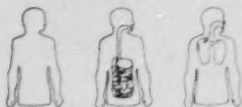


HUMAN PESTICIDE POISONING

33. Human Pesticide Poisoning (title slide).

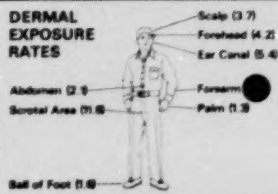
PESTICIDE ENTRY ROUTES

Dermal Exposure Oral Ingestion Respiratory Exposure



34. Pesticides can get into your body and poison you in three ways: 1) dermal exposure--through the skin, 2) oral ingestion--through the mouth, and 3) respiratory exposure--breathing particles or vapors.

DERMAL EXPOSURE RATES



35. Dermal exposure is the most common cause of poisoning to persons that apply pesticides. Rates of absorption through the skin are different for different parts of the body. Using the forearm (1.0) as the standard, absorption is over 11 times faster in the lower groin area. Absorption through the skin in the scrotal area produces the same effect as injecting the pesticide directly into the bloodstream.



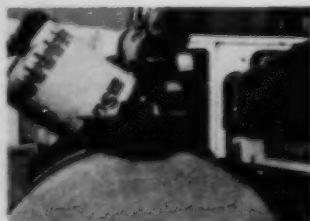
36. The most common cause of pesticide death is children ingesting pesticides that have been carelessly stored or improperly disposed.



37. Oral exposure may occur because of an accident; but, it is more likely to be the result of blowing out a plugged nozzle or smoking and eating before washing contaminated hands.

ORAL TOXICITY	
Oral LD ₅₀	Lethal Dose 150 Lb. Adult
5	Few Drops
50	1 Teaspoon
500	2 Tablespoons
1500	1 Pound
5000	2 Pounds

38. From the LD₅₀ you can estimate the amount of a pesticide that can cause death. It takes just a few drops of a pesticide with a LD₅₀ of 5 to kill a 150-pound man. However, it takes two tablespoons of a pesticide with a LD₅₀ of 500.



39. Respiratory exposure results from breathing pesticide vapors and particles. Recent research shows that a larger concentration of vapors is breathed into the body when handling the concentrated materials during mixing and loading than when actually applying them.

POISONING SYMPTOMS	
• Blurred Vision	• Fatigue
• Diarrhea	• Headache
• Dizziness	• Vomiting
• Excessive Sweating	• Stomach Cramps

40. Early symptoms of pesticide poisoning include: blurred vision, diarrhea, dizziness, excessive sweating, fatigue, headaches, vomiting and stomach cramps.

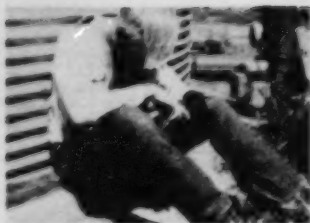
IF YOU SUSPECT POISONING

1. Contact Doctor Immediately!
2. Tell Him What Pesticides Were Being Used!
3. Show Him The Labels!

41. If you suspect poisoning, contact your doctor immediately and tell him what pesticides you have been using. Take the product label to the doctor. Labels contain information needed for treating poisoning.



42. First-aid is the initial effort to help a victim before you get to a doctor. If a person spills a pesticide on himself, drench the victim's clothing and skin with water. The faster the poison is washed off, the less injury will result. If a person splashes some pesticide mixture in his eyes, wash them with water. Holding eyelids open, wash for at least 15 minutes.



43. If a person inhales poisonous fumes, get him into fresh air immediately and loosen his clothing. Apply artificial respiration if breathing has stopped or is irregular.



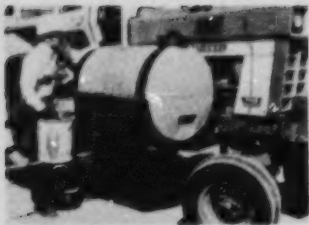
44. Drinking water or milk is the best first-aid for a person who has swallowed a pesticide. Give one to two cups for victims up to 5 years old, and up to one quart for victims over 5. Milk is preferable to water because it helps dilute and neutralize the poison.

PART II. SAFE HANDLING

45. Safe Handling of Pesticides (title slide).



SAFE HANDLING OF PESTICIDES



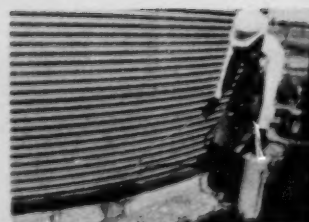
46. Protective clothing prevents absorption of pesticides through the skin. When using any pesticide, wear at least a hat, long-sleeved shirt and long-legged trousers or coveralls. When handling pesticide concentrates, also wear rubber or neoprene gloves and an apron. Protect eyes with goggles or a face shield.



47. Pesticides can penetrate cloth gloves. Unlined rubber or neoprene gloves offer the best protection.



48. Unlined rubber boots also provide good protection. Wear trousers outside of boots to prevent poisonous substances from getting inside.



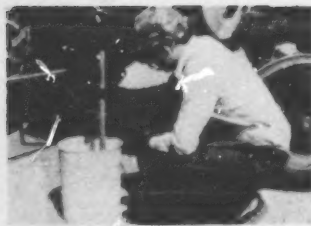
49. If you will be working in a mist or extensive fumes, wear a respirator. Respirators provide protection from inhaling pesticides when fumigating grain bins or using highly toxic materials. The pesticide label will indicate if a respirator is needed.



50. Before opening the pesticide container, read the label carefully for recommended protective clothing, safety precautions and proper equipment selection and operation.



51. Open concentrate containers carefully. To decrease fumes and dust, open paper containers with a knife instead of tearing them.



52. Wettable powders should not be added directly to the spray tank. Premix WP's as a slurry in small containers. Slowly add the mixture to the tank with the agitator running.



53. When pouring or dumping any concentrated pesticide, keep the container below eye level to avoid a splash or spill on face.



54. The environment can be easily harmed by careless mixing and loading practices. If you allow the tank to run over while filling, the overflow will usually end up in the water supply or as toxic puddles on the ground.



55. Avoid spraying near beehives, lakes, streams, pastures, feedlots and sensitive crops whenever possible. If these areas must be sprayed, do not spray on windy days and always spray downwind from the sensitive area. Notify beekeepers in the area when you intend to spray and urge them to take precautions.



56. Do not apply pesticides when drift is likely to occur. Select equipment and formulations that will minimize drift hazards. Winds increase drift and result in the loss of pesticides on treated areas.



57. Clean or unclog nozzles with a soft brush or toothpick. Never try to unclog a nozzle by blowing through it.

GENERAL PESTICIDES

— Clean with 2 Lb. Detergent
per 50 Gal. Water

PHENOXY HERBICIDES

— Clean with 2 Lb. Detergent
per 50 Gal. Water
— Rinse with 1 Gal. Ammonia
per 50 Gal. Water

58. Clean sprayers thoroughly after each use or when pesticides are changed. To clean tanks use 2 pounds detergent per 50 gallons water. If phenoxy herbicides, such as 2,4-D or 2,4,5-T are used in the sprayer, also rinse with ammonia or charcoal solution.

Adviser's Note: See page 28 of the Study Guide for specific directions.



59. Personal protective equipment needs to be washed when the job is completed. Wash respirators, gloves, hats, boots and rubber aprons with detergent and water to get rid of pesticide residue.



60. After using pesticides, wash yourself thoroughly with soap. Soap breaks down chemical residue that may be left on your skin.



61. You should change work clothes every day and wash them separately from the family wash. If concentrated pesticides contaminate clothing badly, dispose of clothes.



62. Store pesticides in a separate building, room or enclosure, depending on the size of your inventory. The storage area should keep the pesticides dry, cool and out of direct sunlight. Some pesticides require protection against extreme heat and freezing. Do not store pesticides near food, feed, fertilizers, seed and livestock medicines.



63. The storage area should be securely locked. Weather-proof signs stating "Danger--Pesticides. Keep Out!" or a similar warning should be posted on the door.



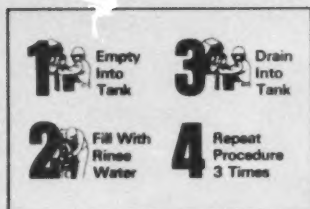
64. Pesticides should never be stored in anything used for food or drink. Store pesticides only in original containers with the labels plainly visible.



65. Check pesticide containers often for corrosion, leaks and loose caps. If containers are damaged, put the pesticide in another sturdy, non-food container that can be sealed. Label the container immediately.



66. Small amounts of surplus tank mixes can be diluted and reapplied to treated areas. Take care that the total application rate does not exceed the label rate. If it is not possible to retreat the area, spray small amounts of the tank mix over another area where you are sure that it will do no harm. Do not drain surplus pesticide near wells, streams, lakes or ponds.



67. Here is a suggested rinse-drain procedure to prepare pesticide containers for disposal. 1) Empty containers into the spray tank and drain in a vertical position for 30 seconds. 2) Fill the containers one-fifth to one-fourth full with rinse water or other diluent. 3) Rinse thoroughly and pour into spray tank. 4) Repeat Steps 1 through 3 until containers have been rinsed three times. After rinsing, puncture, crush or break containers.



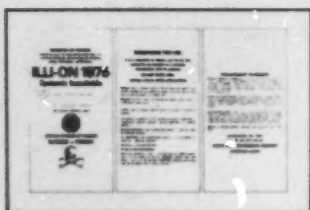
68. Then haul containers to the nearest landfill that handles rinsed pesticide container disposal.



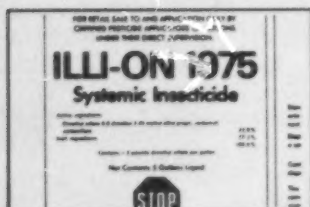
69. Paper bags and other burnable containers may be burned in open fields if state and local regulations permit.



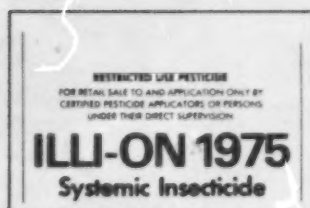
70. Labels and Labeling (title slide). The pesticide label contains all the information necessary for the correct and safe use of any pesticide.



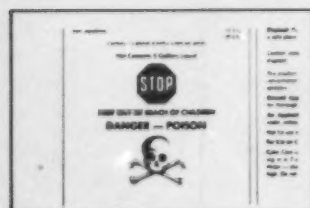
71. If the label is read, understood and all directions are followed, the likelihood of misusing or of having an accident with the pesticide is remote. That is why the most important time in pest control is the time spent reading the label.



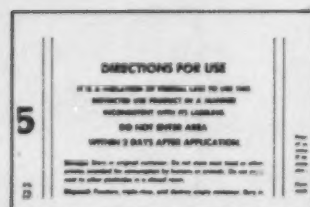
72. The trade or brand name is the manufacturer's name for the product. There may be many trade names for a pesticide, depending upon the number of companies marketing it. The common name for a pesticide is the name agreed upon to identify an active ingredient in a product. Each label must list the active ingredients. The net contents number indicates how much pesticide is in the container.



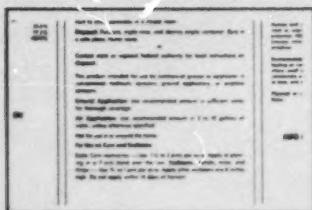
73. All pesticide labels must contain a statement of use classification assigned by the EPA. In classifying a pesticide for either general or restricted use, the EPA considers the toxicity of the pesticide, the way in which the pesticide will be used and the effect of the pesticide on the environment.



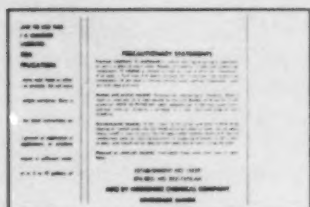
74. Labels do not usually give the toxicity of a pesticide as a LD₅₀ value, the potential danger is indicated, however, by the signal words "Danger-Poison" for highly toxic pesticides, "Warning" for moderately toxic pesticides and "Caution" for pesticides with low and slight toxicity. The statement "KEEP OUT OF THE REACH OF CHILDREN" is also required on each pesticide label.



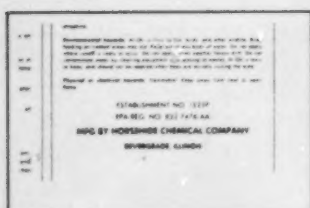
75. Immediately under the heading "Directions for Use" on the label, the manufacturer will again indicate whether the pesticide is for general or restricted use. The label lists only registered uses for the pesticide. Remember--it is illegal to use any pesticide in a manner not listed on the label. Each label contains specific limitations on reentry to treated areas.



76. The directions for use include: 1) crops, animals, areas or objects to be treated; 2) pests that the pesticide will control; 3) the amount to use; 4) methods of application and type of equipment; 5) frequency and timing of applications necessary to obtain effective results; 6) instructions for proper storage and disposal of the pesticide and its container; and 7) limitations on use.

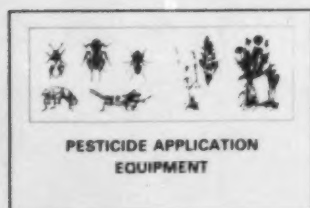


77. The pesticide label contains precautionary statements for applicators, children, domestic animals, wildlife and the environment. Labels for all highly toxic pesticides must give instructions for first-aid treatment in case of accidental poisoning. Warnings indicating whether the pesticide is flammable or explosive also appear on the label.

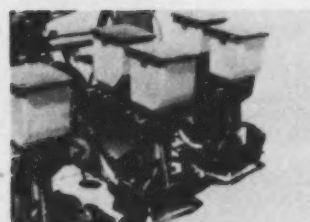


78. The manufacturer of a pesticide is required to list the name and address of the company on the label so that the applicator will know where to call for information in case of an emergency. Look for two numbers on the pesticide container: the registration number indicates that the product has been registered with the U.S. EPA and the establishment number indicates the factory that produced the pesticide.

PART III. PESTICIDE APPLICATION



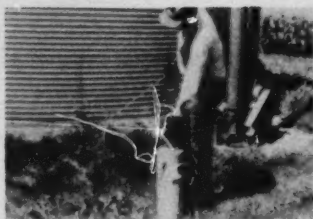
79. Pesticide Application Equipment (title slide).



80. Many types of equipment are available including granular applicators,



81. aerial sprayers and



82. ground sprayers. Ground sprayers are the most common applicators for pest control in Illinois. Ground sprayers may be small hand sprayers for garden pest control; high pressure sprayers for spraying fruits, vegetables and trees;



83. or low pressure, general use sprayers. Low pressure, general use sprayers are designed for spraying crops, turf, pasture, fencerows and livestock. They are used to apply herbicides, insecticides and fertilizers. General use sprayers may be tractor-mounted, pulled or self-propelled. Small tank sprayers (50-200 gallons) require low flow rates and usually have roller-type pumps that limit spraying pressure to 80-150 PSI.



84. High-capacity sprayers with large tanks (200-1,600 gallons) require high flow rates for proper agitation and usually have centrifugal pumps. Centrifugal pumps have a long life even with abrasive pesticides; however, maximum spraying pressures are limited to 50-60 PSI.

NOZZLES CONTROL

1. Spray Volume
2. Uniformity
3. Coverage
4. Drift

85. Selecting the proper spray nozzle for each job is important when applying pesticides. Nozzles control the volume of pesticide applied, the uniformity of application, the thoroughness of surface coverage and the amount of spray drift that will occur.

NOZZLE TIPS

1. Regular Flat-Fan
2. Even Flat-Fan
3. Flooding Flat-Fan
4. Hollow Cone
5. Whirl Chamber
6. Boomless

86. Although nozzles have been developed for many kinds of spray application, there are only a few types used for pest control in Illinois. They include regular flat-fan, even flat-fan, flooding flat-fan, hollow cone, whirlchamber and boomless nozzles.

REGULAR FLAT-FAN NOZZLE

USE

Broadcast Herbicides,
Soil Insecticides,
Fertilizers

PRESSURE

15-30 PSI
Never Over 40 PSI



87. Regular flat-fan nozzles are most commonly used for pesticide application. They are used to broadcast herbicides and apply soil insecticides and fertilizers. Flat-fan nozzles produce a medium to coarse spray. Operating flat-fan nozzles between 15-30 PSI and never over 40 PSI avoids drifting.

OVERLAP NOZZLES 30-50 percent



88. Since the outer edges of the spray pattern receive less material than the center, adjacent nozzles must be overlapped 30 to 50 percent to obtain uniform coverage with regular flat-fan nozzles. Regular flat-fan nozzles are usually spaced on 20-inch centers at a boom height of 17-23 inches.

EVEN FLAT-FAN NOZZLE

USE

Band Spraying

PRESSURE

15-30 PSI
Never Over 40 PSI



89. Even flat-fan nozzles apply an even coverage across the entire width of the spray pattern. Otherwise, they are similar to the regular flat-fan nozzles. Even flat-fan nozzles should be used only for band spraying pesticides. Operate even flat-fan nozzles between 15 and 30 PSI.

FLOODING FLAT-FAN NOZZLE

USE

Broadcast Herbicides,
Soil Insecticides,
Fertilizers

PRESSURE

5-25 PSI



90. Flooding flat-fan nozzles are recommended for broadcasting herbicides, mixtures of herbicides, soil insecticides and applying fertilizers and layby herbicides. Boom-mounted on 40- to 120-inch centers, flooding nozzles spray wide swaths with few nozzles. Operating flooding flat-fan nozzles at low pressures--5-25 PSI--produces large droplets in a wide flat-fan pattern.

**DOUBLE OVERLAP REQUIRED
FOR UNIFORM COVERAGE**



91. The spray pattern for the flooding nozzles is not as uniform as regular flat-fan nozzles so flooding nozzles must be mounted to obtain double coverage. Streaks resulting from one nozzle will be covered by the overlap from one of the adjacent nozzles.

HOLLOW CONE NOZZLE

USE

Insecticides, Fungicides

PRESSURE
60-120 PSI



92. Hollow cone nozzles are used for insecticides and fungicides where penetration and coverage are essential for effective insect and disease control. Hollow cone nozzles produce small droplets that penetrate under the leaves better than the droplets produced by other nozzles. The extremely fine droplets that form result in a severe drift problem. Operate hollow cone nozzles between 60 and 120 PSI.

WHIRL CHAMBER NOZZLE

USE

Preplant, Incorporated
Herbicides, Aircraft,
Mist Blowers

PRESSURE
5-25 PSI



93. Whirl chamber nozzles are commonly used to apply pre-plant, incorporated herbicides. There is little problem with whirl chamber nozzles clogging. However, one disadvantage with nozzles producing a cone pattern is that they will not provide uniform distribution unless the nozzles are tilted forward or backward on the boom. For minimum drift, whirl chamber nozzles should be operated at pressures of 5-25 PSI.

BOOMLESS NOZZLE

USE

Pastures,
Fencerows,
Roadsides

PRESSURE
10-30 PSI
Never Over 40 PSI



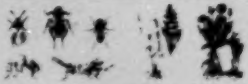
94. Boomless nozzles are used to spray swaths up to 30 feet or more. They are susceptible to drift and the distribution is not as uniform as with other nozzle types. Boomless nozzles produce small droplets immediately under the nozzle but large droplets are deposited at the outer edge of the swath. They are not recommended for field crops but they are suggested for spraying pastures, fencerows and roadsides.

MATERIALS

RELATIVE LIFE

Brass	1
Plastic	3
Stainless Steel	10-50
Tungsten Carbide	200

95. Nozzles are manufactured in various materials, brass being the most common. Brass is relatively inexpensive, but it is not resistant to abrasion. Stainless steel is non-corrosive and much more resistant to abrasion than brass. Nylon and other plastics are resistant to corrosion but are subject to swelling by some liquids. For limited use, brass tips are probably the most economical. For more extensive use, especially with WP's, consider other types.



APPLYING PESTICIDES

96. The performance of any pesticide depends on the proper application of the correct amount of pesticides (title slide). The purpose of calibration is to apply a precise amount of pesticide uniformly over a given area. The following procedure can be used for band, broadcast, row crop and directed spraying.

GALLONS PER ACRE DEPEND ON:

1. Nozzle Output.
2. Sprayer Ground Speed and
3. Sprayed Width per Nozzle.

97. The volume of spray applied per acre depends on three variables: nozzle flow rate, the ground speed of the sprayer and the sprayed width per nozzle.

1. NOZZLE OUTPUT (GPM)

- Nozzle Size
- Spray Mixture
- Pressure 0.1 GPM @ 20 PSI
 0.2 GPM @ 80 PSI

98. Nozzle output varies with the size of the nozzle tip, the pesticides and fertilizers sprayed and the pressure of the spray nozzle. Pressure does not vary directly with the nozzle output. To double the flow rate of a nozzle applying 0.1 GPM at 20 PSI, increase the pressure four times--to 80 PSI. Major changes in spray volume cannot be made by varying pressure.

2. SPRAYER GROUND SPEED

- 5 MPH @ 4 GPA
- 10 MPH @ 2 GPA

99. However, when increasing the ground speed of a sprayer, the volume applied decreases proportionally. Doubling the speed cuts the volume applied by one-half. For example, increasing the speed from five to ten MPH lowers the GPA from four to two.

3. SPRAYED WIDTH PER NOZZLE

- 20 inches @ 20 GPA
- 40 inches @ 10 GPA

100. Increasing the sprayed width per nozzle decreases the spray volume. For example, if you are using regular flat-fan nozzles on 20-inch spacings and switch to flooding nozzles on 40-inch spacings, the volume of spray would drop from 20 GPA to 10 GPA. This assumes that both nozzles have the same flow rate.

SELECTING NOZZLE TIPS

STEP 1 - OBTAIN SUGGESTED APPLICATION VOLUME

- Use GPA From Label
- Example 15 GPA

101. Selecting the proper nozzle tips is an important part of sprayer calibration. The first step in selecting nozzle tips is to obtain the suggested application volume (GPA) from the pesticide label or printed recommendations. For this example, assume you want to apply Lasso at 15 GPA.

STEP 2 - DETERMINE SPRAYER GROUND SPEED

Distance (Feet)	Speed (MPH)
	5 6 7 8 10
176	24 20 17 15 -
352	- - - 30 24

102. Step 2 is to select or measure an appropriate ground speed. At the throttle setting and gear you plan to use, clock how long it takes you to travel a premeasured distance. Then determine the ground speed by using a table like the one shown here. If it takes 17 seconds to travel a 176-foot course, the ground speed is 7 MPH.

Adviser's Note: Since 1 MPH = 88 feet per minute, marking off multiples of 88, such as 176 or 352, will simplify the calculations.

$$\text{Speed (MPH)} = \frac{\text{DISTANCE (FEET)} \times 60}{\text{TIME (Seconds)} \times 88}$$

$$\text{MPH} = \frac{176 \times 60}{17 \times 88}$$

$$\text{MPH} = 7$$

103. Or use the equation: $\text{MPH} = \frac{\text{distance traveled (feet)} \times 60}{\text{time (sec)} \times 88}$

For example, if you find it takes 17 seconds to travel a 176-foot course, the ground speed is: $\text{MPH} = \frac{176 \times 60}{17 \times 88} = 7$.

Once you have determined the speed, record the throttle setting and drive gear used.

STEP 3 - DETERMINE SPRAYED WIDTH PER NOZZLE (W)

W = Nozzle Spacing
(Boom Spraying)

W = Band Width
(Band Spraying)

Example: W = 40 inches

104. Step 3 is to determine the spray width per nozzle (W) inches. For boom spraying, W is the nozzle spacing. For band spraying, W is the band width. In this example, assume that you are using flooding nozzles on 40-inch boom spacings. Therefore, W equals 40 inches.

STEP 4 - DETERMINE OUTPUT REQUIRED FOR EACH NOZZLE IN GALLONS PER MINUTE (GPM)

$$\text{GPM} = \frac{\text{GPA} \times \text{MPH} \times W}{5940}$$

105. Step 4 is to determine the output required for each nozzle using a nozzle manufacturer's catalog, tables or this formula: $\text{GPM} = \frac{\text{GPA} \times \text{MPH} \times W}{5940}$

$$GPM = \frac{GPA \times MPH \times W}{5940}$$

GPA = 15 (Step 1)

MPH = 7.0 (Step 2)

W = 40 (Step 3)

$$GPM = \frac{15 \times 7.0 \times 40}{5940} = 0.71$$

106. In the example GPA = 15, MPH = 7.0, and W = 40. Put these numbers into the formula: $GPM = \frac{15 \times 7.0 \times 40}{5940} = 0.71$. Each nozzle requires an output of 0.71 gallons per minute.

STEP 5 - SELECT A NOZZLE THAT WILL GIVE THE OUTPUT DETERMINED IN STEP 4 (0.71)

107. Step 5 is to select the nozzle that will give the output determined in Step 4 when operating within the recommended pressure range.

FLOODING NOZZLE TIP	PRESSURE PSI	CAPACITY GPM
	10	50
	30	85
	40	100
TK 7.5	10	.75
W	20	1.10
D 7.5	30	1.30

108. To use a flooding nozzle, select a nozzle with an output of .71 GPM at a pressure between 5 and 25 PSI. From a nozzle manufacturer's catalog, a TK5 or D5 has an output of .71.

PRECALIBRATION CHECK



109. After you have installed the nozzles, make a precalibration check. First, install the selected nozzle tips. Second, partially fill the sprayer tank with water. Third, operate the sprayer within the recommended pressure range.



110. Place containers, quart jars work fine, under each nozzle to see if the jars fill up at the same amount of time. Replace nozzles with output varying more than 10 percent from the average and change tips with different fan angles and non-uniform spray patterns.

CALIBRATING THE SPRAYER

STEP 1 - CONVERT OUTPUT (GPM) TO OUNCES PER MINUTE (OPM)

OPM = GPM x 128
OPM = 0.71 (STEP 4) x 128
OPM = 91

111. After you have selected and installed the proper nozzle tips, the actual sprayer calibration can be done quickly. Frequent checks can be made to make sure you are putting on the correct amount of pesticide. Step 1 is to convert the nozzle output, previously measured in GPM, to ounces per minute (OPM). Multiplying GPM times 128 will give you the output in OPM. For our example, OPM equals 91.

VOLUME (GPA)	SPEED (MPH)				
	5	6	7	8	9
10	1.1	1.3	1.5	1.7	1.9
15	1.6	1.9	2.3	2.6	2.9
20	2.2	2.6	3.0	3.5	3.9

From The Table The OPM Factor Is 2.3
 $2.3 \times 40 = 91$ OPM

112. If you do not want to use the formula, this table is available on bottom of page 33 in the Study Guide. The number at the intersection of the speed and volume columns is the OPM factor. Determine the output required per nozzle by multiplying the factor by the spray width per nozzle. From the table the factor is 2.3. Therefore, the nozzle output is 2.3×40 (nozzle spacing) or approximately 91 OPM.

Adviser's Note: The actual OPM factor is 2.26. For this slide set the factor has been rounded to 2.3, which would give 92 OPM instead of 91 OPM.

STEP 2 - MEASURE THE OUTPUT IN OUNCES PER MINUTE (OPM)

113. Step 2. Measure the output in ounces per minute by collecting the spray from one nozzle. Adjust the pressure until the amount collected is the same as the amount determined in Step 1. Check a second nozzle for accuracy. If it is not possible to obtain the desired output, select a different nozzle tip size or ground speed and recalibrate. Nozzles must be operated within the recommended pressure range.

STEP 3 - ADD PESTICIDE TO PARTIALLY FILLED TANK OF WATER ADD WATER TO DESIRED LEVEL

STEP 4 - CHECK CALIBRATION IN FIELD

114. Step 3. Add the proper amount of pesticide to a partially filled tank of water. Finish adding water to the desired level. Step 4. Operate the sprayer in the field at the predetermined ground speed and pressure. After spraying a known number of acres, check the liquid level in the tank to verify that the right amount of pesticide is being applied.

STEP 5 - CHECK NOZZLE OUTPUT PERIODICALLY



115. Because of nozzle wear and clogging, periodically check the nozzle output. This can be done quickly every day, every tankful, or whenever you want to see if the output has changed. Adjust the pressure to compensate for small changes. When the output has changed 10 percent or more from that of a new nozzle or when the spray pattern has become uneven, replace the nozzle tips and recalibrate.

HOW MANY ACRES (A) CAN YOU SPRAY PER TANK?

- The Sprayer is Calibrated at 15 GPA
- You Have a 300 Gallon Tank

$$\frac{300 \text{ Gal.}}{\text{Tank}} \times \frac{A}{15 \text{ Gal.}} = \frac{300}{15} = 20 \text{ A/Tank}$$

116. After the sprayer is calibrated to apply the correct amount per acre, you must determine how much material should be put in a spray tank. To do this, decide how many acres you can spray per tankful. If a farmer's sprayer is calibrated at 15 GPA and he has a 300-gallon tank, take 300 gallons per tank and divide by 15 gallons per acre. This means that he can spray 20 acres for every tankful of pesticide mixture.

HOW MUCH PRODUCT SHOULD YOU ADD TO THE TANK?

- You Want to Apply Aatrex 80W at 3 Pounds Per Acre

$$\frac{20 \text{ A}}{\text{Tank}} \times \frac{3 \text{ Lbs.}}{A} = 60 \text{ Lbs. Aatrex 80W}$$

117. Now it is easy to decide how much pesticide you will need to add to each tank. If you want to apply Aatrex at three pounds per acre, multiply 20 acres per tank by 3 pounds per acres. This means 60 lbs. of Aatrex 80W should be added to each tank (300 gallons) of water.

HOW MUCH PRODUCT SHOULD YOU ADD TO THE TANK?

- You Want to Apply Lasso at 2 Quarts Per Acre

$$\frac{20 \text{ A}}{\text{Tank}} \times \frac{2 \text{ Qts.}}{A} = 40 \text{ Qts. Lasso}$$

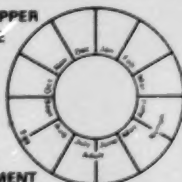
118. If you want to apply Lasso at 2 quarts per acre, multiply 20 acres per tank by 2 quarts per acre. This means that 40 quarts or ten gallons of Lasso should be added to each tank (300 gallons).

PART IV. PEST IDENTIFICATION

INSECTS AND INSECT RELATIVES

119. Insects and Insect Relatives (title slide). There are both useful and destructive insects. However, the number of beneficial insects far outnumbers the destructive insects. Before applying a control measure for an insect, you must identify the insect, assess its population and damage, and know when a control is necessary. If you need help in identifying a particular insect, consult your county Extension adviser.

GRASSHOPPER LIFE CYCLE



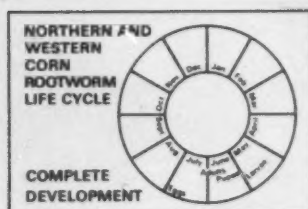
120. Gradual Development. Insects whose young (called nymphs) appear very similar to the adult have a gradual development. The adult is recognized by its wings; nymphs are wingless. The adult and the nymph often live in the same habitat.



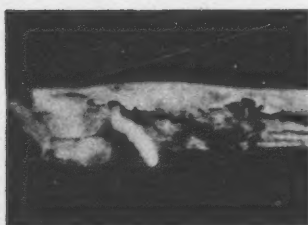
121. Grasshopper Nymph. The grasshopper is a typical insect having gradual development. This nymph is very similar to the adult it will later become. Nymphs cannot reproduce.



122. Grasshopper Adult. Grasshopper adults will attack many Illinois crops, feeding from the outer edges of the leaf inward. Hot, dry weather favors their development. The adult grasshopper's ability to fly allows it to move considerable distances between and within fields.



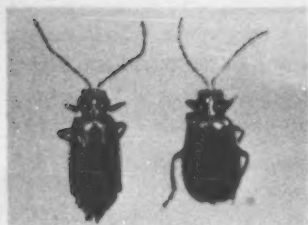
123. Complete Development. Insects whose adult and young are very different in appearance and habits undergo complete development. The adult female lays her eggs; they hatch into larvae. When a larva is full grown, it forms a pupa. During the pupa stage the adult form takes shape.



124. Corn Rootworm Larvae. Corn rootworms exhibit complete development. The eggs are laid in the soil, where the larvae hatch and feed on corn roots. Rootworm larvae are capable of causing severe damage to a corn field if populations are high.

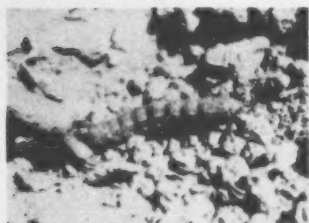


125. **Corn Rootworm Pupa.** A full-grown larva forms a pupa in the soil. It is during this stage that the drastic change in appearance takes place and the adult emerges.



126. Corn Rootworm Adult. The adult rootworm lives above ground and feeds on corn silks, pollen and other blooming plants, including weeds. The adult female will deposit her eggs in the soil, beginning the next generation. The Northern corn rootworm (on the right) and the Western corn rootworm (on the left) are pictured here.

Adviser's Note: Beginning here we will identify insect pests by major crop: corn, alfalfa and soybeans. If the insect is important on more than one crop, it will be noted.



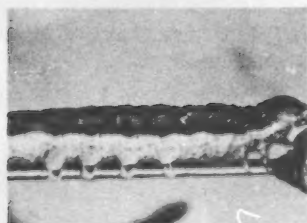
127. Black Cutworm. Black cutworm larvae chew large holes in corn stalks below the soil surface, often severing small plants and causing large plants to wilt and die. The larvae are two inches long when full grown. Damage usually occurs in late May or early June. Black cutworms do not overwinter in Illinois.



128. Flea Beetle. Flea beetles are about the size of a pinhead, smooth, shiny, roundish and black. They jump readily when disturbed. They feed on the outer layer of corn leaves, but don't chew completely through the leaf. Severely damaged seedlings appear whitish or silvery and may die. Flea beetles are known to transmit Stewart's Disease to corn.



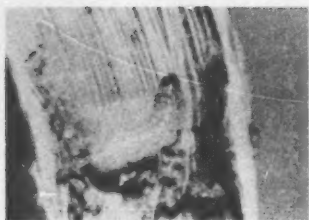
129. Wireworm. Wireworms are larvae of click beetles. They may attack the corn seed or bore a hole in the base of the stalk. Wireworms kill small plants and cause the center leaves of large plants to wilt.



130. Armyworm. Armyworms chew leaves, beards and sometimes cut the heads of small grains and grasses. They will often migrate from maturing grain fields into adjacent corn fields. Adult moths will usually select heavy, rank wheat or grassy cornfields to lay their eggs.



131. Tachnid Fly Egg on Armyworm. The adult fly, a little larger than a house fly, lays one or more eggs on the skin of caterpillars. The egg is laid behind the head of the caterpillar, so that it cannot be dislodged easily. A maggot hatches and tunnels into the body of the caterpillar where it feeds and eventually kills the caterpillar. The adult fly has one pair of filmy wings.



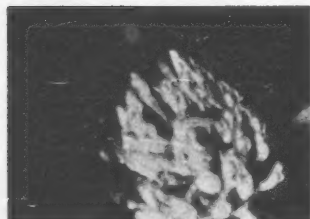
132. European Corn Borer. European corn borers overwinter as full-grown larva in cornstalks. This first brood usually causes the greatest yield reduction. Moths lay eggs on the underside of leaves, preferring the tallest corn in the area. The larvae feed in the whorl, then tunnel into the stalk or ear shank causing breakage or ear drop.



133. Fall Armyworm. Fall armyworm is a pest of late maturing corn. Larvae will feed on leaves and in the whorl. Plants can usually recover without greatly affecting yield. The young worms feed on the exposed leaves while older and larger worms feed on rolled leaves in the whorl.



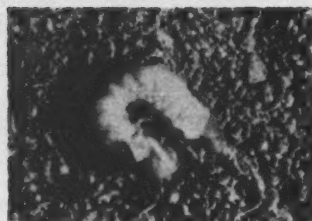
134. Corn Leaf Aphid. Appearing in mid-summer, the small, bluish-green, corn leaf aphid competes with the corn plant for moisture. Aphids will cluster on leaves, in the whorl, on the tassel and on the silks and will suck sap from the plant. A heavy infestation may cause the plant to wilt, curl and yellow. Aphids don't overwinter in Illinois.



135. Aphid Lion. Aphid lion larvae eat soft-bodied insects such as aphids and small caterpillars. They use their curved saber-like mouthparts to insert in their prey and drain the body juices. A helpful predator, the aphid lion larva has three pair of walking legs.



136. Syrphid Fly Larva. The syrphid fly larvae (maggots) also prey on aphids. A helpful predator because they are specific in their selection of prey. The maggot has mouth hooks that they insert into their prey. Maggots have no legs of any kind.



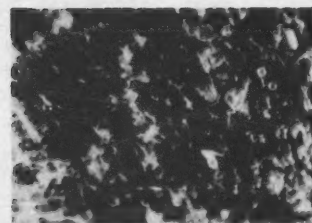
137. White Grub. White grubs are larvae of the June beetle and its relatives. They attack many crops including corn and soybeans. On corn, plants may be stunted and lodged due to root pruning. Common in lawns and gardens white grubs feed on the plant roots. Some species complete their life cycle in one year and others require three years.



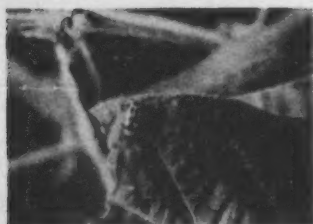
138. Alfalfa Weevil Larva. Alfalfa weevil larvae attack the first cutting of alfalfa. Severely damaged fields take on a whitish cast. The larvae feed on terminal leaves causing the leaves to dry rapidly. Feeding on alfalfa for three or four weeks, the larvae are green with a black head and white strips down the middle of the back.



139. Potato Leafhopper. The potato leafhopper is a green wedge-shaped insect as both an adult and nymph. The leafhopper sucks sap from alfalfa reducing the quantity and quality of the crop. Generally, the second and third cuttings are most likely to be injured. This insect does not overwinter in Illinois.



140. Spider Mite. Spider mites appear as tiny black specks and are insect related, having four pairs of legs. Feeding on the underside of soybean leaves, the mites leave webbing where they have fed. Damage usually begins along field edges where mites migrate from adjacent grasses. Infestations and damage are higher during hot, dry periods.



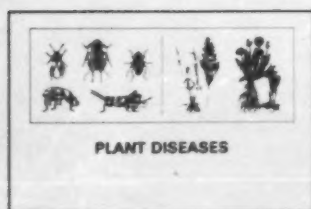
141. Bean Leaf Beetle. Bean leaf beetles attack soybean plants, feeding on leaves. This damage is usually not economic unless over 40 percent of the leaf surface is removed during the seedling stage. These beetles can cause economic losses by also feeding on blossoms and pods.



142. Green Cloverworm. Green cloverworm attack soybeans, causing ragging and defoliation of the plants. The larvae are light green with two thin white stripes along each side of the body. Green cloverworms are highly susceptible to disease and parasitism, which usually keep their populations below economic levels.



143. Stink Bug. Feeding by stink bugs on soybeans causes shriveling and dimpling of the seed.

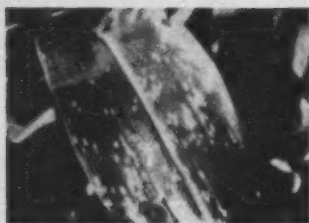


144. Plant Diseases (title slide). A plant disease is defined as the condition of a plant that is different from the normal plant in either structure or function. There are three conditions necessary for a plant disease to occur: a susceptible host plant, a disease-producing agent and a favorable environment for disease development.

Adviser's Note: The first eight slides are corn diseases.



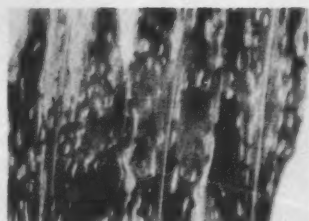
145. Corn Seedling Blight. Soil-inhabiting fungi and seed-borne fungi cause seedling blights. Seedling blights are controlled by fungicide seed treatment and by planting in warm ($>50^{\circ}\text{F}$), well-prepared seed beds.



146. Common Corn Rust. Common corn rust is controlled by using tolerant hybrids. Although infections are found on tolerant hybrids, corn rust does not usually develop to damaging levels. Fungicide sprays are occasionally used for control in seed production fields.



147. Northern Corn Leaf Blight. Northern corn leaf blight usually starts on lower leaves. It is most often controlled by planting resistant hybrids. If the leaves in the lower one-third of the plant are severely infected before two weeks after tasseling, fungicide sprays may be economical.



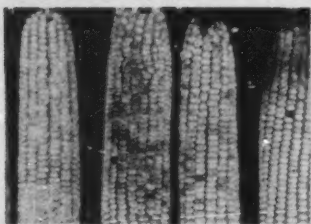
148. Southern Corn Leaf Blight. Like Northern corn leaf blight, Southern corn leaf blight is controlled by planting resistant varieties. This fungus, as with most other fungal leaf blights, survives winters and between corn crops on crop debris. Fungicide sprays may be used if necessary.



149. Stalk Rot. Corn stalk rots result in premature plant death and harvest losses. Stalk rots may be caused by several different inhabiting fungi. Stalk rot is reduced by growing stalk rot-resistant hybrids with good stalk strength characteristics, by planting the correct populations for a particular hybrid, and by controlling soil insects. An adequate fertility program, natural soil fertility and rainfall also affect stalk rot development.



150. Gibberella Stalk Rot. This stalk rot is easily identified by the reddish distortion of stalk tissues.



151. Corn Ear Rots. A) Diplodia Rot, B) Fusarium Rot, C) Giberella Rot. Ear rotting fungi can cause serious storage problems and may produce toxins that are poisonous to livestock. Resistant hybrids and insect control are the best defenses against these diseases. Warm, wet weather at silking through pollination and at harvest favors the development of corn ear rots.

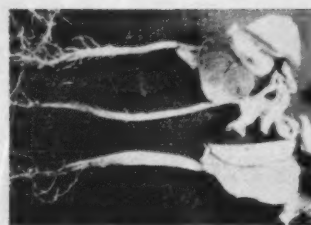


152. Maize Dwarf Mosaic Virus. This insect-spread virus causes stunted growth and reduced yields. Maize dwarf is reduced by planting resistant hybrids and controlling Johnsongrass where the virus overwinters.

Adviser's Note: The following slides are soybean diseases.



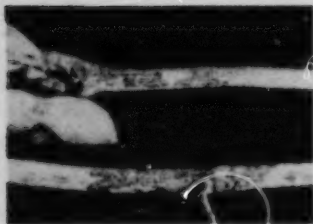
153. Soybean Seed Rot and Seedling Blight. Seed rots and seedling blights are caused by soil-inhabiting and seed-infecting fungi. Planting high quality seed in warm ($>55^{\circ}\text{F}$) well-prepared seed beds will control these fungi. Seed-borne fungi are often involved in damping-off problems. While fungicide seed treatments will improve plant stands, yield increases with high quality seed are uncommon.



154. Rhizoctonia Root Rot. Brown to reddish cankers at or near the soil line characterize Rhizoctonia root rot. Rhizoctonia is a common soil-inhabiting fungus.



155. Septoria Brown Spot. Septoria brown spot is the most common cause of premature defoliation of Illinois soybeans. This fungus survives on crop debris. It first infects lower leaves and gradually causes complete defoliation. Fungicide sprays partially control Septoria brown spot.



156. Pod and Stem Blight. Pod and stem blight is commonly found in soybean fields at harvest. It is one of the most important soybean diseases in Illinois because it infects seeds causing poor seed quality and premature plant death. Fungicide sprays will control this disease. It is most severe if warm weather predominates during the pod-fill development stage.



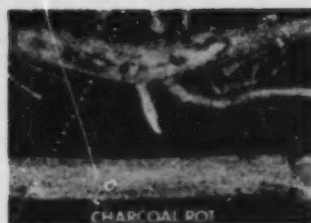
157. Soybean Cyst Nematode. Oval areas of yellowed, stunted plants, which are streaked in the direction of planting, characterize the soybean cyst nematode. Plants should be carefully dug and the roots washed to see cysts. The nematodes are spread by anything that moves infested soil.



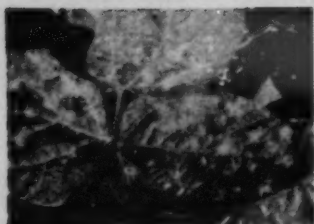
158. Soybean Cyst Nematode. The small pear-shaped brown to white bodies are female cyst nematodes. The cysts are approximately one-quarter the size of the head of a pin. Soybean cyst nematodes are controlled by resistant varieties, crop rotation and nematicides.



159. Purple Seed Stain. Purple seed stain commonly infects soybean seeds and can be a cause of poor seed quality. Warm, wet weather during pod-fill favors this disease. Fungicide sprays give excellent control.



160. Charcoal Rot. Charcoal rot may cause premature plant death in warm seasons. It attacks most crop plants grown in Illinois. Adequate fertility and deep plowing will help control this disease. Charcoal rot is identified by scraping the bark off the lower stem or tap root and checking for the black sclerotia that look like charcoal scattered throughout the tissue.



161. Powdery mildew. Powdery mildew is a relatively new soybean disease and is not thought to be economically important in Illinois. The white powdery growth on the upper leg surface is characteristic.



162. Soybean Mosaic Virus. Soybean mosaic virus can resemble injury by certain herbicides. In contrast to herbicide injury, where most plants in the area are affected, usually only 1 or 2 percent of the plants are affected by soybean mosaic virus.

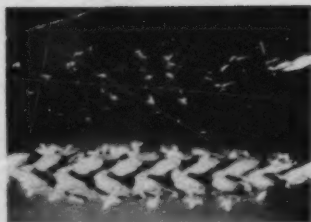
Adviser's Note: The following slides are wheat diseases.



163. Take-all. Like most crown and root wheat diseases, take-all will first show up as areas of stunted, prematurely ripening wheat.



164. Take-all Crown and Root Symptoms. The dark discoloration of the roots and lower stem is characteristic for take-all. This disease can be controlled by crop rotations, adequate fertility and planting after the "fly-free" date.



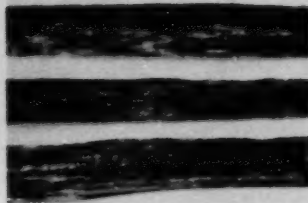
165. Loose Smut. Loose smut causes a symptomless seed infection. Infected seed will produce smutted heads. The percentage of smutted heads will equal the yield loss since infected plants are otherwise normal. Seed treatment with a systemic fungicide will provide control. Some resistant varieties are available.



166. Wheat Soil-Borne Mosaic Virus. Areas of stunted yellowed wheat with mosaic symptoms on the leaves indicate a virus infection. The exact virus can only be identified in a laboratory test.



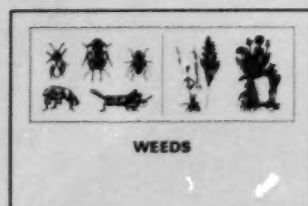
167. Resistant varieties are available for some viruses, such as soil-borne mosaic. Resistant varieties may show virus symptoms so long as temperatures are less than 50°F. New growth on resistant varieties will not show symptoms when warm conditions prevail.



168. Septoria Leaf Blotch. Septoria leaf blotch is common in wet growing seasons. The black dots release millions of spores when wet. This disease may cause yield losses of 20 percent or more in wet seasons. Crop rotation, planting after the "fly-free" date, fungicide sprays and resistant varieties control Septoria leaf blotch.



169. Powdery mildew. The white powdery growth on the leaves is characteristic of powdery mildew on wheat. This disease may cause serious lodging and yield losses by destroying leaf tissue. Lush growth in fields heavily fertilized with nitrogen is favorable for powdery mildew development. This disease is controlled primarily through the use of resistant varieties.



170. Weeds (title slide). Weeds may be defined as plants out of place. They compete with crop plants for moisture, nutrients, light and growing space, reducing yields.

PREPLANT
 - Before Crop Is Planted
PREEMERGENCE
 - Before Weeds Emerge
POSTEMERGENCE
 - After Crops or Weeds Have Emerged

171. The use of herbicides is one of the most effective ways to control weeds. To obtain best results, you must understand the meaning of three words: Preplant (use of a herbicide before the crop is planted); preemergence (use of a herbicide before weeds emerge); and postemergence (use of a herbicide after the crop or weeds have emerged).

ANNUAL
 - One-Year Life Cycle
BIENNIAL
 - Two-Year Life Cycle
PERENNIAL
 - Lives More Than Two Years

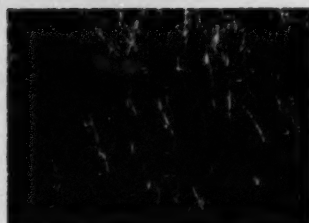
172. An annual weed grows, matures, sets seed and dies within one year. Biennials have two-year life cycles. Perennial weeds live more than two years.



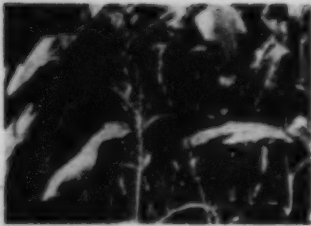
173. Giant foxtail, yellow foxtail, large crabgrass and fall panicum are summer annual grasses. Giant Foxtail usually appears in cultivated crops and is the most serious grass weed in Illinois. It is recognized by its long drooping seedhead and the short hairs over the top surface of the leaf blade.



174. Yellow Foxtail. Yellow foxtail has a bristly cylindrical seedhead that is shorter than giant foxtail and stands upright. It has several long hairs on the leaf surface near the junction of the blade and sheath. The stem of yellow foxtail is often purple and flattened. Yellow foxtail is found in all areas except woodlands.



175. Large Crabgrass. Large crabgrass has hairy sheaths and blades and the seedhead is fingerlike. It is a problem in fields, lawns and gardens. Seeds germinate only when the soil is warm.



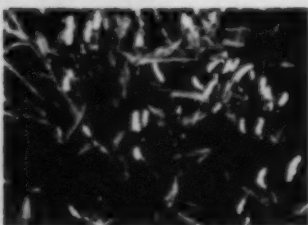
176. Fall Panicum. Fall panicum has a smooth leaf blade and sheaths. The seedhead is an open panicle with single seeds per spikelets. The midvein of the leaf is prominent and the underside of the leaf blade is shiny. Fall panicum is common in corn and soybean fields.



177. Quackgrass and Johnsongrass are perennial grasses. Quackgrass is a cool season grass and it is a problem in northern Illinois pastures and cropped areas. It has a blue-grey color. Quackgrass is spread by seed and underground rootstalks.



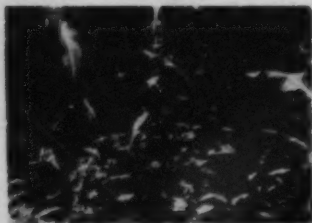
178. Johnsongrass. Johnsongrass is a warm season grass that is a problem in Southern Illinois, particularly in the river bottom areas. It is a robust grass with a prominent midvein and has a panicle seedhead.



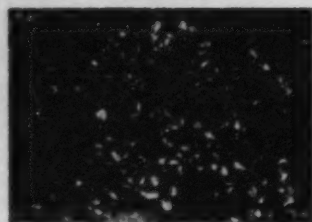
179. The next seven species are broadleaf annuals. Smartweeds have alternate strap-shaped leaves and red to white seedheads. They are a problem in fields, waste areas and along ditches.



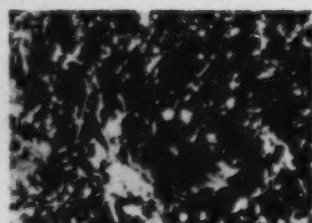
180. Lambsquarter. Lambsquarter has ridged stems and leaves that have a white, mealy surface appearance. It is found mainly in cultivated crops.



181. Redroot Pigweed. Sometimes called rough pigweed, red-root pigweed has tall rough stems with rough dull green leaves. The seedhead is bristly. Pigweed is found in fields, yards and waste areas.



182. Purslane. Purslane is a weed problem in gardens and vegetable growing areas. It is a prostrate plant with fleshy leaves and reddish stems. It has small yellow flowers and its seeds are found in small capsules. Purslane germinates in warm soils.



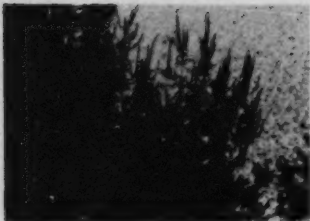
183. Common Chickweed. Common chickweed is a cool season weed found in gardens, lawns and legume meadows. It has small opposite ovate leaves with light green color. Chickweed has small white flowers with deeply-notched petals. The seeds are found in pods.



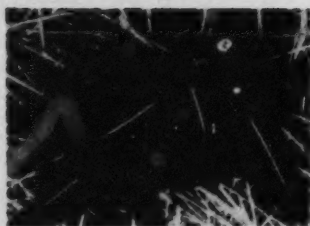
184. Velvetleaf. Velvetleaf is a tall plant with large heart-shaped leaves covered with short velvety hairs. It has yellow flowers and its seeds are found in multi-chambered capsules. The velvetleaf weed is found in corn and soybean fields.



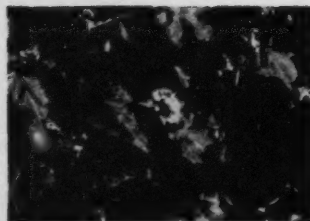
185. Common Cocklebur. Cocklebur is a bushy plant with alternate triangular leaves that are rough. The seeds are borne in burs. Cockleburs are found in cultivated fields and waste areas.



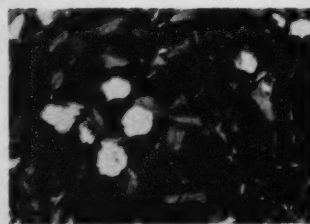
186. Common Ragweed. Ragweed has rough hairy stems. It produces an abundance of pollen and is a hazard to hayfever sufferers. Ragweed is found in wastelands.



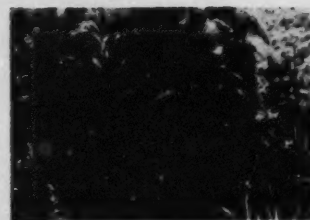
187. Common Milkweed. Milkweeds are upright, nonbranching plants with opposite fleshy leaves and milky juice. Their sweet smelling pink flowers are found in ball-like clusters. The seed pod is oblong and contains many flat, oval seeds with a tuft of silky hairs attached. Milkweeds are found everywhere in Illinois.



188. Climbing or Honeyvine Milkweed. Sometimes called blue-vine, the climbing milkweed is a vine with smooth, heart-shaped leaves. Flowers are small whitish clusters. The seed pod is oblong and smooth containing many flat oval seeds with a tuft of silky white hairs at the tip. The climbing milkweed is found in cultivated fields and along fencerows where the soil is fertile and moist.



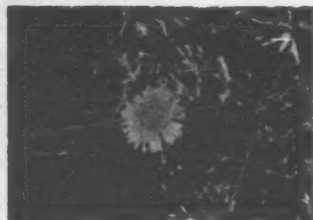
189. Field Bindweed. The field bindweed is a creeping deep-rooted perennial with twining stems. It has alternate ovate leaves with spreading basal lobes. The flowers are white or pink and funnel-shaped. They measure about one inch in diameter. Seeds are found in small round pods each containing four seeds. Field bindweed is common in cropping areas.



190. Poison Ivy. Poison ivy is a woody perennial that spreads by seed and rootstalks. It may be a low shrub or climbing vine. Leaves consist of three large shiny leaflets with pointed tips. Poison ivy may cause blistering on the skin.



191. Canada Thistle. The Canada thistle is a perennial thistle with creeping horizontal roots. The leaves are spiny and have crinkled edges. Flower heads are not spiny. It is a problem over the northern half of the state but it is most serious in the most northern counties.



192. Dandelion. The dandelion is a cool season perennial weed found in lawns and pastures. It has lobed leaves forming a basal rosette. It has yellow flowers and its seedhead bears a tuft of hairs.



193. Musk Thistle. The musk thistle is the only biennial plant shown. It forms a spiny basal rosette with a fleshy taproot the first year and an upright stem that produces flowers the second year. The reddish-purple flowers are rounded and one to two inches in diameter. Musk thistles are found in pastures and wastelands and along roadsides.



194. Yellow Nutsedge and wild garlic are also perennials. Yellow nutsedge, sometimes called nutgrass, has a triangular stem with light green flowers. It is a problem in cultivated fields and pastures with low, damp soil.



195. Wild Garlic. A cool season perennial, wild garlic spreads by underground and aerial bulblets as well as by seed. It has hollow tubular stems and a distinct odor. Wild garlic is found in Southern Illinois wheat fields, pastures and lawns.

DISCUSSION QUESTIONS

PART I - PESTICIDES AND YOU

1. Discuss the definitions and the relationship of toxicity, signal words and oral LD₅₀.
2. What is the most likely way you as an applicator can become contaminated from pesticides?
3. Where is the latest information on treatment for human pesticide poisoning available? How do you contact them?
4. Discuss basic first-aid procedures that should be taken in case of pesticide poisoning.

PART II - SAFE HANDLING

1. Discuss at least three operations when you are most likely to be poisoned from pesticides.
2. What is the minimum protective clothing you should wear when handling concentrated pesticides?
3. How should pesticides be stored to eliminate the chance of poisoning to humans, animals and the environment?
4. Discuss the best methods of disposing of empty, noncombustible and combustible containers. Also, how would you dispose of surplus pesticides?
5. What information is found in the precautionary statements on the label?

PART III - APPLICATION EQUIPMENT

1. What precautions should be taken when cleaning a sprayer after using phenoxy herbicides such as 2,4-D and 2,4,5-T? Why?
2. Why is it necessary to select proper nozzles for the job you are doing? What types would you select for applying preplant herbicides, 2,4-D, fungicides, etc?
3. How can you determine the correct nozzle tip size to use?
4. Discuss briefly the steps in calibrating a sprayer.
5. When should nozzles be replaced?

PART IV - PEST IDENTIFICATION

1. What should you consider before applying a control for an insect?
2. What conditions are necessary in order for a plant disease epidemic to develop?
3. Discuss the differences between annual, biennial and perennial weeds. How do these differences affect your weed control program?